

Brazos Electric Power Cooperative, Inc.

**Proposed Maypearl Peaking Power Plant
Alternative Evaluation Analysis**

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1. Introduction

Brazos Electric Power Cooperative, Inc. (“Brazos”) is an electric generation and transmission (“G&T”) cooperative whose members' service territory extends across 68 counties from the Texas Panhandle to Houston. Organized in 1941, Brazos was the first cooperative formed in the Lone Star state for the purpose of generating and supplying electrical power. Brazos is currently the largest G&T cooperative in Texas. Brazos provides electric service under full requirements wholesale contracts to sixteen (16) member electric distribution cooperatives and one municipal electric system. Brazos provides the wholesale electric capacity requirements of its members whose peak summer load presently exceeds 3,000 megawatts (“MW”). Additional information can be obtained by visiting Brazos website: www.brazoselectric.com.

As discussed more fully in this report, Brazos has determined that the proposed Maypearl Peaking Power Project (“Project”), a new 380 to 430 MW gas-fired combustion turbine plant, is the best solution to meet a portion of its projected load growth and resulting capacity deficit from 2017/2018 forward. Brazos intends to obtain financing for the Project through the U.S. Department of Agriculture, Rural Utilities Service (“RUS”), and as a result, the proposed Project must be reviewed under the National Environmental Policy Act (“NEPA”). RUS is required by its NEPA regulations to evaluate the environmental impacts of the Project and prepare an environmental assessment (“EA”) along with a Finding of No Significant Impact (“FONSI”) prior to providing long-term financing for the Project. This Alternatives Evaluation Analysis is among the initial steps in the NEPA process and is intended to provide the public, governmental agencies, and other interested parties with sufficient background information so that they can provide feedback to RUS and Brazos regarding issues that should be addressed during the environmental review of the Project.

In summary, this report documents the purpose and need for the proposed Project, discusses the various alternatives that have been considered to meet the projected future load growth, and summarizes the process used to determine that the Project is the most feasible option to serve Brazos' load.

2. Project Overview

Brazos proposes to develop the Project, a new a 380 to 430 MW (net) gas-fired, combustion turbine generating unit with a projected in-service date in 2018. The estimated cost of the project is approximately \$190 to \$254 million (including owner's costs and interest during construction). The proposed Project will be located on a 40 acre greenfield site approximately 16 miles due north of Hillsboro, TX approximately 3 miles from the Itasca Landfill in an unincorporated area of Hill County, TX. The output of the Project will be used to meet a portion of Brazos' load requirements in its members' service territory within the Electric Reliability Council of Texas (“ERCOT”).

3. Project Need & Justification

Brazos has a need to add peaking generation capacity to its current mix of generation resources to serve the growing loads within the service territories of its member distribution cooperatives. Beginning in 2015, Brazos will be in a capacity deficit position as a result of the difference between its existing and projected generating capacity and the total of its demand requirements, other load requirements, and required system reserves in ERCOT. This deficit is projected to be approximately 1,400 MW in 2017 and increase from between 100 and 225 MW per year thereafter due to forecasts in demand growth. This capacity deficit is further exacerbated with phased retirements of the Miller resource that are planned in 2018 and 2022¹.

The determination of the amount of new peaking generation capacity was established based on forecasted load growth, load profile characteristics, the existing and projected resource mix, and an evaluation of various potential third-party power supply and anticipated ERCOT wholesale market options. New peaking generation capacity is also needed to function as a contingency resource to mitigate potential unplanned outages associated with Brazos' existing generating resources. Such Contingency mitigation is of particular concern in light of projected diminishing reserves in ERCOT over the forecast period.

Existing Power Supply Resources

A list of the existing power supply resources used to meet Brazos' requirements in the ERCOT area is shown in Table 1 below:

Table 1: Brazos Existing Generation Resources

Resource Name	Capacity (2017)	Structure	Type	Year
Whitney Dam ¹	42 MW	PPA	Hydro	1952
Sandy Creek ²	375 MW	PPA	PC	2013
San Miguel	196 MW	PPA	PC	1981
Jack County 1 & 2	1,205 MW	Ownership	CC	2006 – 2010
Johnson County	265 MW	Ownership	CC	1997
R.W. Miller 1-3 ³	386 MW	Ownership	ST	1968 – 1975
R.W. Miller 4 & 5	<u>206 MW</u>	Ownership	CT	1994
Total	2,675 MW			

Note 1: Whitney Dam capacity was upgraded to 42 MW and returned to service in 2014.

Note 2: 2012 load forecast reflects capacity for Sandy Creek at 375 MW; however, 2014 verified capacity increases Brazos position to 383 MW which will appear in Brazos' 2014 load forecast (when completed in 2015).

Note 3: Capacity decreases to 523 MW and 410 MW in 2018 and 2022, respectively. RW Miller steam turbines (became unavailable in 2014 due to drought conditions effecting the captive cooling lake (Lake Palo Pinto).

¹ Sustained hydrologic conditions at Lake Palo Pinto could accelerate the planned ramp-down of the RW Miller steam turbine units, and likewise the capacity deficits associated with the earlier ramp down.

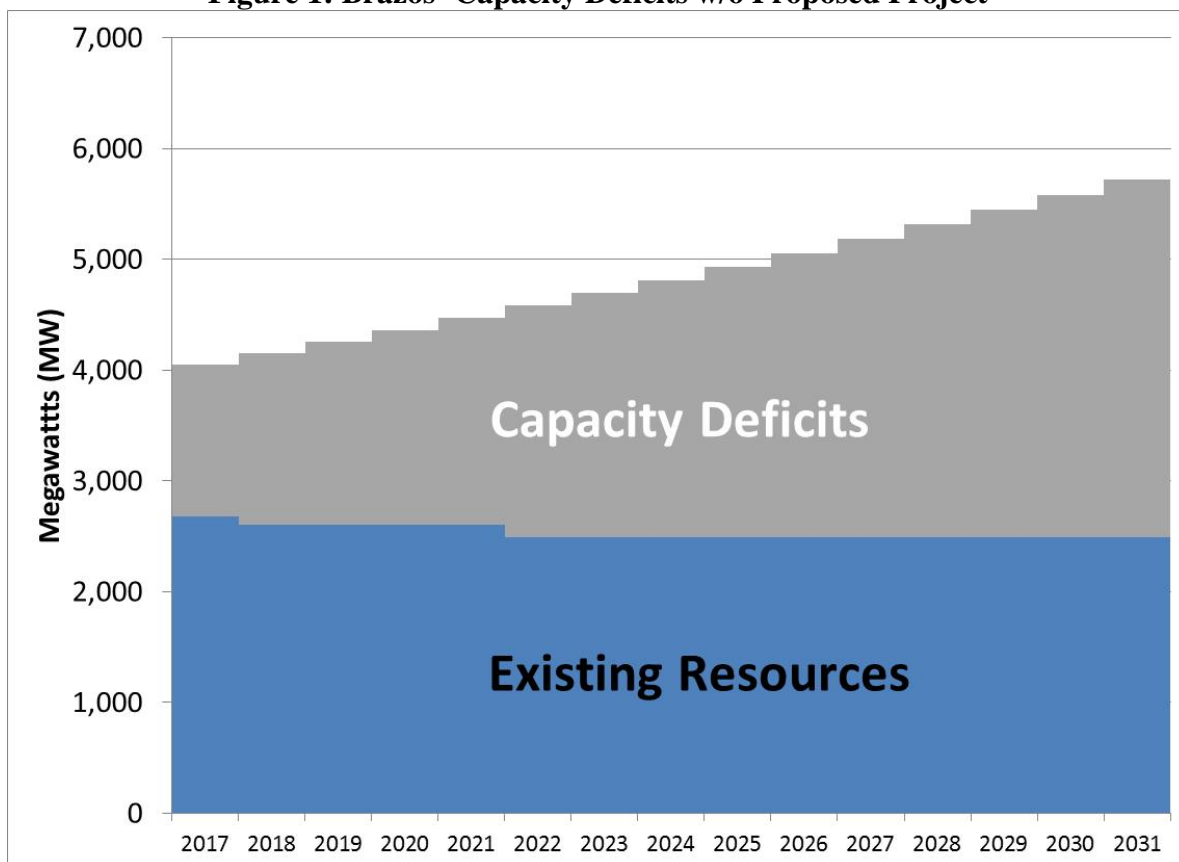
Capacity Requirements

The Brazos Board and RUS-approved 2012 load forecast and Brazos’ existing power supply portfolio were used as the basis to determine the total capacity needs for the period 2017 through 2031. Brazos’ projected power supply needs in ERCOT are presented below in Table 2 and graphically in Figure 1.

Table 2: Brazos Load, Resources & Capacity Deficits (MW)

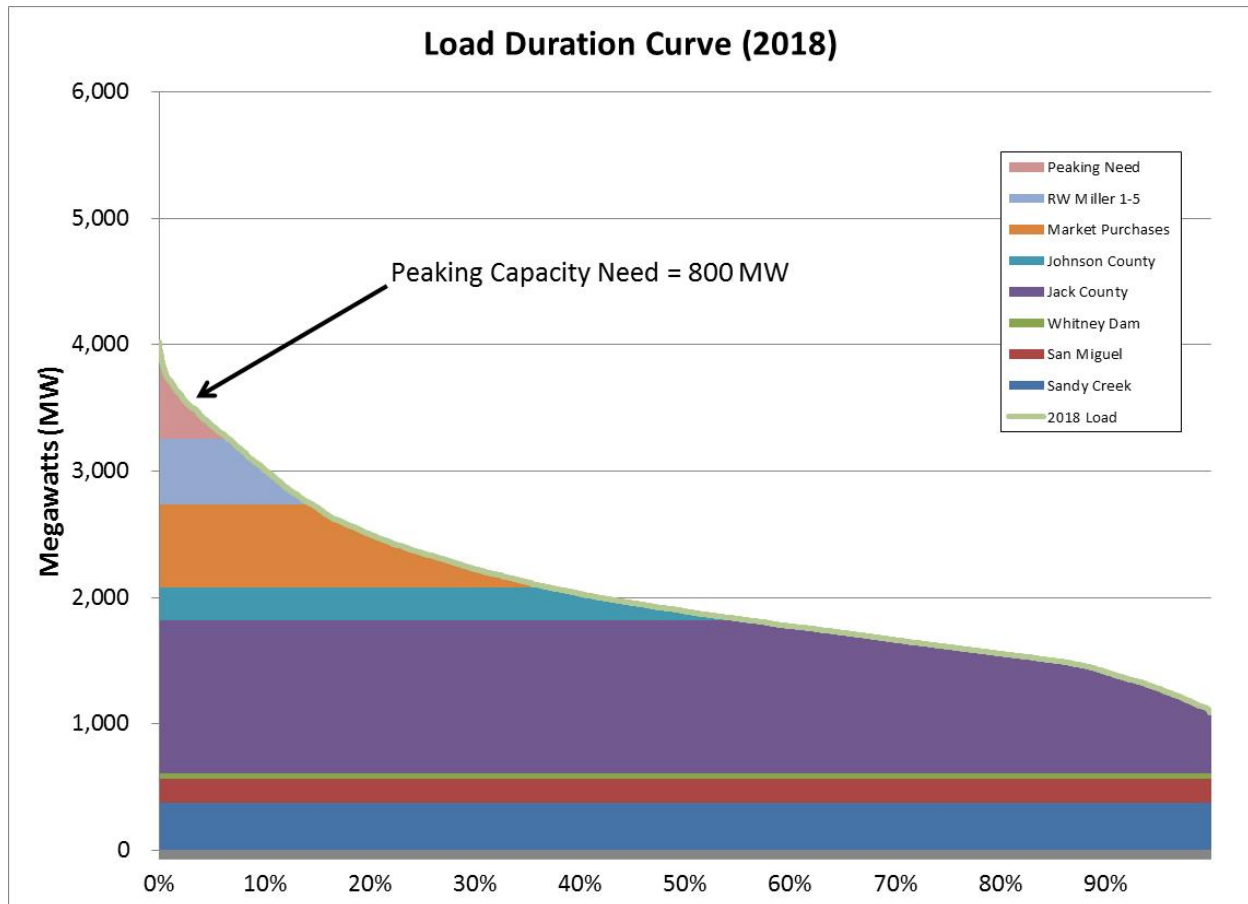
(Values in MW)	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Peak Load @ 2.5% growth rate	3681	3773	3867	3964	4063	4165	4269	4376	4485	4597	4712	4830	4951	5074	5201
Reserves @ 10%	368	377	387	396	406	417	427	438	449	460	471	483	495	507	520
Total Requirements	4049	4150	4254	4360	4469	4582	4696	4814	4934	5057	5183	5313	5446	5581	5721
Existing Resources	2675	2606	2606	2606	2606	2493	2493	2493	2493	2493	2493	2493	2493	2493	2493
Capacity Deficit	(1374)	(1544)	(1648)	(1754)	(1863)	(2089)	(2203)	(2321)	(2441)	(2564)	(2690)	(2820)	(2953)	(3088)	(3228)

Figure 1: Brazos’ Capacity Deficits w/o Proposed Project



As illustrated in the following load duration curve (see Figure 2), of the total capacity deficit Brazos has a need of up to 800 MW of peaking capacity beginning in 2018, after consideration of short term contracts and market purchases are incorporated into Brazos’ power supply portfolio.

Figure 2: Brazos' Load Duration Curve (2018)



4. Alternative Evaluation Analysis

2014 Power Supply RFP Process

Based upon the demonstrated need, and in accordance with RUS regulations, Brazos issued a Request for Proposals (“RFP”) in March 2014 for peaking resource(s) with up to 800MW of capacity and associated energy, in increments of 200 MW, to be delivered within the ERCOT system with a preference for deliveries with the North Load Zone, to begin on or after January 1, 2017, but no later than June 1, 2018. The RFP indicated that responses obtained through the solicitation would be compared against self-build option(s), and that a minimum power supply term of ten (10) years was required, but a 15-year term was preferred.

The RFP solicitation process was intended to be the sole basis for determining alternatives to the proposed Project. The RFP provided that Brazos would evaluate any and all proposals that complied with the RFP instructions, including but not limited to: conventional, gasification, internal combustion engines, nuclear, renewable resources with firm energy and capacity, as well as long-term power supply sales, tolling structures, joint asset ownership, and build/sale offers. However, the RFP stated that the following options were of particular interest to Brazos:

- Option #1 Unit contingent power sales from existing or proposed units to be owned by or under the control of the Respondent.
- Option #2 Offers for Brazos to participate in the ownership of Respondent’s existing units or planned units to be built by the Respondent.
- Option #3 A system power sale by an investor owned utility, municipally owned utility, electric cooperative, or independent power producer owning multiple units.
- Option #4 Expressions of interest in joint ownership in a possible Brazos Electric capacity option to be built by Brazos Electric in the future.

Brazos received a total of forty-two (42) separate proposals from nineteen (19) respondents that ranged from tolling arrangements to asset ownership. Table 3 below provides a summary of the responses received.

Table 3: Summary of RFP Responses

Type	# of Proposals	Capacity Range (MW)	Term Range (Years)
Unit Ownership	6	225 - 696	30
Power Purchase Agreements	15	200 - 521	10 - 15
Tolling Arrangements	21	144 - 800	15 - 30

Initial RFP Analysis

All proposals received on time and deemed complete were reviewed and evaluated by Brazos and Alliance for Cooperative Energy Services Power Marketing, LLC (“ACES”) an energy services and consulting company retained by Brazos, based upon the following general factors:

- Adequacy and completeness of the proposal with regards to the information specified
- Pricing and/or payment structure
- Technically capable of providing power consistent with the proposal
- Existing resource versus new project with development, construction and startup risk
- Respondent’s business and operational background and experience
- Respondent’s proposed terms and conditions
- References

The intent of this initial screening process was to provide the necessary assurance that proposals made by Respondents were legitimate and that the proposed projects could operate or otherwise be viable over the long term. Following the initial screening using the aforementioned factors, ACES and Brazos conducted an economic evaluation on the qualified proposals. Based upon the economic evaluation of the qualified proposals along with the results of the initial screening, a short-list of proposals was identified to serve as a basis to compare Brazos’ self-build option. The short-listed RFP proposals consisted of four (4) power purchase agreements (“PPA”) and

one (1) tolling arrangement for a total of five (5) power supply alternatives. Brazos entered into discussions with the shortlisted respondents to clarify their proposals and confirm pricing and other terms. As a direct comparison to the self-build project, Brazos also evaluated several viable ownership offers and met with the developers to determine project status and risks.

Summary of Self-Build Selection

As mentioned above, Brazos has a demonstrated need of 800 MW of peaking capacity beginning in 2018. To meet this need through a self-build option, Brazos analyzed various technologies and concluded that the most viable choice (based on economic, operational, environmental, and other relevant factors) for self-build peaking generation was natural gas-fired simple cycle combustion turbine technology. Brazos then evaluated various simple cycle combustion turbine technologies based upon relevant factors (i.e., capital costs, starting cost/characteristics, heat rates, operations and maintenance costs, emission rates, reliability, and market availability of turbines) and concluded that F-class was the most economic and appropriate combustion turbine technology to meet its peaking capacity needs.

Costs estimates for both new and previously manufactured² F-class combustion turbines of various model vintages were then obtained by Brazos, and incorporated into the overall cost of various plant block size configurations that included estimates for the engineering-procurement-construction (“EPC”) contract, land purchases, owner development, electric and gas interconnection, and other relevant costs associated with the construction of an electric generation facility. Based upon Brazos’ review of the various plant configurations, their associated cost and operational characteristics, it was determined that a nominal 380 MW facility, consisting of two (2) 7FA.04 General Electric (GE) combustion turbines was the most appropriate configuration to compare on an economic basis against the short-listed RFP proposals. Brazos also evaluated and considered GE model 7FA.03 turbines (172 MW), which have limited availability confined to secondary market sellers, as well as the latest 5-series turbines from GE and Siemens, models 7FA.05 (208 MW) and F(5) (227 MW), respectively.

It should also be noted that while Brazos’ total projected peaking need is 800 MW, Brazos elected to pursue and evaluate incremental project sizes in an effort to partially mitigate the risks associated with projected future load growth being lower than presently forecasted, significant loss of current projected load, future availability of competitively-priced PPAs or generation ownership, and/or other factors that could reduce the incremental capacity required for future peaking generation or defer the need for incremental capacity until future planning years. Brazos prudently continues to investigate developing an 800 MW peaking facility, based on multiple F-class combustion turbines each with a nominal 200 MW output rating, at various sites to secure the option of installing additional peaking capacity above the proposed plant configurations as may be dictated by future load projections and resource availability. At present, Brazos intends to meet the remaining capacity deficit through short-term purchases from ERCOT market participants until such time that a sustained capacity deficit warrants the need to build or otherwise acquire additional long-term capacity.

² Previously manufactured indicates unused/unfired turbines held in storage, offered for sale by OEMs and non-OEM 3rd Parties.

Concurrent with the 2014 Power Supply RFP process, Brazos commissioned a Gas Turbine Siting Study that evaluated a range of potential sites in its members' service territories for the feasibility of developing an 800 MW natural gas-fired generation facility. Based upon Brazos' aforementioned evaluation of combustion turbine technology and plant configurations, the ranking of results and shortlisted sites in the site selection study, negotiations with gas pipeline owners, projected cost of transmission interconnection, successful landowner solicitation and acceptance of offers for land acquisition, and consideration of on- and off-site development impacts and costs, Brazos concluded that the most appropriate self-build option to evaluate against other power supply alternatives was the proposed Project.

Summary of Short-List Evaluation

Following the determination of the proposal short-list through the process described above, the successful Respondents were asked to confirm their proposals and pricing assumptions. An economic analysis of the updated short-listed proposals and the self-build option was conducted by ACES and Brazos. The economic analysis measured the margins generated by each of the self-build and short-listed options compared to the forward cost curve for power, after netting out the respective fixed and variable costs of each alternative. A net present value of the annual margins for each of the options was then used to determine the normalized value in \$/kW for each option. Table 4 below provides a comparison of the economic feasibility of the various power supply alternatives as determined by Brazos.

Table 4: Economic Evaluation of Short-List

Proposal	Type of Proposal	NPV (\$/kW)
Brazos (Self-Build)	Asset	\$59
Bidder 1	PPA	(\$15)
Bidder 2	Tolling	(\$51)
Bidder 3	PPA	(\$104)
Bidder 4	PPA	(\$147)
Bidder 5	PPA	(\$149)

Several sensitivity analyses were conducted to investigate the impact of different assumptions on the outcome of the economic evaluation including changes in interest rates, capital costs, and the price of natural gas. The sensitivities performed did not change the outcome of the original analysis. Furthermore, the capital cost sensitivity included cost parameters that confirm Brazos has the economic flexibility to select among alternative F-class configurations as turbine and EPC contract market conditions warrant at the time of final turbine selection. To the extent that these alternative F-class configurations have better capital cost or operating efficiencies, such improvements are expected to incrementally enhance the economic feasibility of the Project.

5. Conclusion

Brazos has demonstrated the need to add peaking generation capacity to its current mix of generation resources, based on forecasted load growth within its member cooperatives' service territories. Through an RFP process, Brazos considered and evaluated various alternatives to meet this growing capacity need on the ERCOT system. Based upon an analysis and economic evaluation of these alternatives, Brazos concluded that best power supply alternative to meet its peaking capacity needs was the self-build option (the proposed Project). This conclusion was further supported by sensitivity analyses that offered Brazos the opportunity to further refine the design and configuration of the Project if warranted by prevailing market conditions.